

be cast by each spark. The two shadows will be seen to be most beautifully tinted with different delicate colours, varying according to the metal inserted in B.

It will be seen that the shadow thrown by A is lighted by B, and is seen on a ground jointly illuminated by A and B; whilst B's shadow, lighted by A, is seen on the same common coloured ground as before.

Without these considerations, it might have been supposed that the shadow thrown by B, and lighted by the unchanging spark A, would itself have remained unaltered. I saw it of the colours, pink, light pink, dim pink, light green, nearly white, and yellow-green; corresponding to the introduction into B of Bi, Ag, Sn, In, Al, and Mg respectively.

I was indebted for the apparatus to Prof. Liveing, in whose laboratory last November, at Cambridge, I made these observations. C. T. L. WHITMELL

Nottingham, March 16

OUR ASTRONOMICAL COLUMN

ANTHELM'S STAR OF 1670 (II VULPECULÆ).—In the catalogue of stars observed at the Royal Observatory, Greenwich, in the year 1872, in the volume lately circulated, will be found the position of the small star near the place of Anthelm's star of 1670, which was for some time of the third magnitude. It is No. 816 in the above-named catalogue, and for 1875.0 its R.A. is 19h. 42m. 32s. 78., and N.P.D. 62° 59' 15".4. This is only about one minute of arc from the place given by Picard's observations published in Lemonnier's "Histoire Céleste," and there is an uncertainty in the R.A. deduced from those observations amounting to one or two seconds of time. The star deserves attention, and the more so as there has been a suspicion of sensible variation about an average minimum for some years past. It may be advantageously compared with a star of pretty nearly the same magnitude following 12s.5 in R.A., and 4'9 to the north, and also with one which follows 22s.5, about 0'7 to the north. Occasional slight variations are perceptible in Nova (Ophiuchi), 1848, usually of 12'13 magnitude, and, according to Schönfeld's observations in Nova (Coronæ), 1866, also, as we have lately stated, in the star close upon the position of Nova (Cassiopeæ), 1572. We follow the example of the Mannheim astronomer in applying the term Nova to these objects, though it would probably be more correct in each case to consider them as belonging to a class of irregular variables of great extremes of brightness. Mr. Tebbutt, of Windsor, N.S.W., was satisfied from his own observations that η Argus had been "alternately above and below a mean magnitude" for several years previous to 1870.

METEOR-SHOWER OF OCTOBER A.D. 855.—This shower of meteors does not fall in with the thirty-three year period indicated by Prof. H. A. Newton; but from the description in "Annales Fuldenses," it was evidently one of similar character, and indicated a great accumulation of meteors in a part of their orbit far distant from the mass encountered by the earth in 1799, 1833, and 1866. We read: "Mense vero Octobris xvj. Kal. Novemb. (i.e. October 17, O. S.), per totam noctem igniculi, instar spiculorum, occidentem versus per aerem densissime ferebantur." It was from a comparison of this date with that of the great display in 1366, witnessed in Bohemia and in Portugal, that Boguslawski suspected an advance in the nodes of the meteor-orbit at a time when its real form had not been detected. Quetelet, in his "Nouveau Catalogue des Principales Apparitions des Etoiles Filantes," refers to an Arabic account of the same shower (855), and on the same date, Oct. 17, in the following year, he mentions the occurrence "des feux semblables à des pointes parcourent le ciel pendant toute la nuit," on the authority of a chronicler whose history is found in Bouquet's Collection; suspecting, however, its identity with the shower recorded by the Fulda annalist. We know that there are recent cases of considerable numbers of meteors on or

about November 12, which are also divergent from the thirty-three year period for maximum, as on Nov. 12, 1820 and 1822; but the shower of October 17, 855, appears a remarkable instance. The dense stream towards the west brings to recollection the grand display of November 1866.

COMET 1840, III.—This comet, discovered by Dr. Galle, at Berlin, on March 6, and observed at Pulkova till the 27th of the same month, affords a curious instance where one of these bodies, after apparently encountering the powerful influence of the planet Jupiter, has presented itself in these parts of space moving in an orbit which is undistinguishable from a parabola. Definitive elements have been lately calculated by Kowalczyk and Doberck, and if we trace the path backward thereby, to the beginning of 1839, we find the distance between the comet and planet about January 20 would be less than a third of our mean distance from the sun. It is true the interval over which the observations extend is only three weeks, but the residual errors of the parabola are so very small, that it is evident no very sensible ellipticity was produced by the near approach to Jupiter, as would appear to have been the case with many other comets. There is a suspicion that something similar took place with the third comet of 1759, which passed so near the earth in January 1760, but the elements of that body may perhaps admit of better determination. Lacaille's orbit shows a pretty close approach to Jupiter on the comet's journey towards the sun, a circumstance first referred to by Pingré.

THE BIRDS OF BORNEO*

THE fifth volume of the annals of the "Museo Civico" of Genoa (for the establishment of which science is indebted to the liberality and exertions of the Marchese Giacomo Doria) is devoted to an elaborate memoir on the birds of Borneo, prepared by the well-known ornithologist, Tommaso Salvadori, of the Museum of Turin. The work is based upon the rich collections made by Doria and his companion, Dr. Beccari, during a scientific expedition to Borneo in 1865 and the following years. Whilst the latter naturalist devoted himself principally to plants, and obtained an enormous series of them which has enriched many of the herbaria of Europe, the former occupied himself in general zoological collections. Among the results of his activity were upwards of eight hundred specimens of birds, obtained chiefly near Kutchin, the capital of Sarawak, which was the head-quarters of the travellers. Dr. Salvadori having had this fine collection placed in his hands for examination, thought the opportunity was favourable for attempting a complete account of the birds hitherto known to have been obtained in Borneo, on which, up to the present time, there has been no authority. In the present memoir we have the results of his labours, forming altogether a volume of 430 pages.

Considering the large extent of the island of Borneo, the published works of naturalists upon its fauna are few, and a large portion of its varied surface remains still unexplored. As regards its ornithology, we are indebted to the naturalists formerly employed by the Dutch National Museum at Leyden for the greater part of our knowledge. Schwaner, Diard, Salomon Müller, and others, made rich collections in the territories of Pontianak and Banjer-massing, fifty years ago, and supplied many of the types figured by Temminck in his "Planches Coloriées." Our Mr. Wallace was the first ornithological explorer of Sarawak, but never published any complete account of his collections made there. Another English naturalist, James Mottley, also made several collections in the island of Labuan and in Banjer-massing. These were partly described in 1855, in a work commenced by Mr. Mottley

* "Catalogo sistematico degli uccelli di Borneo," di Tommaso Salvadori con note ed osservazioni di G. Doria ed D. Beccari, intorno alle specie da essi raccolte nel Ragiato di Sarawak.

in conjunction with Mr. Dillwyn. But Mr. Mottley's untimely death in the Malay insurrection of 1860 put a stop to the publication, though his Banjermassing collection was subsequently catalogued by Mr. Sclater in the Zoological Society's "Proceedings."

From these and various other authorities, of which a complete account is given in the introduction to the work, and from the study of Doria's numerous series, Dr. Salvadori has compiled his list of 392 species of Bornean birds. Their synonymy is very fully stated, and the localities are completely given, whilst descriptions and remarks of various characters are added when necessary. Of the 392 species of Bornean birds, fifty-eight, Dr. Salvadori tells us, are peculiar to the island, whilst the remainder are found also in Malacca and Sumatra, or have a still wider distribution. With these last-named countries it is, as already pointed out by Lord Walden,* that Borneo has a most intimate relation, upwards of 250 species being common to these three localities. These and many other facts relating to the ornithology of Borneo are well put together by our author in this excellent memoir, on which it is obvious great labour has been bestowed. The volume is rendered still more complete by an outline map of Borneo and the adjacent islands, and by several coloured plates of the rarer species of birds, amongst which the extraordinary shrike-like form called *Pityriasis gymnocephala* forms a conspicuous object. Dr. Salvadori's work is thus an indispensable addition to a naturalist's library.

PHENOLOGICAL PHENOMENA†

UNDER the title given below a pamphlet has just been issued containing instructions for the correct observation of the first appearance of insects, birds, and plants in flower in any locality. We recommend it to the attention of all who have opportunities of making such observations, and there are thousands who have. If a host of observers could be enlisted in this work, and if they adhered faithfully to the instructions given in the pamphlet, they would not only find a new source of real pleasure and instruction, but would certainly make large contributions to our knowledge of natural history.

A list is given of ninety-seven plants, insects, and birds to be observed, with a set of general rules, approximate phenological dates, and special remarks and suggestions in connection with the various divisions. Those in botany are drawn up by the Rev. T. A. Preston, F.M.S.; in entomology, by Mr. R. McLachlan, F.L.S.; and in ornithology, by Prof. A. Newton, F.R.S. Each of them presents a series of notes on various individual plants and animals, and Prof. Newton has some general remarks in his own department, from which we make the following extracts:—

"It constantly happens, especially among the earlier birds of passage in spring, that they will for some days haunt one particular spot before appearing in others or generally throughout the district. I myself knew a particular reach of a river which was yearly frequented by the Sand-Martin for nearly a week or ten days before examples of that species were to be seen elsewhere in the vicinity. I also knew a parish in which the Chiffchaff always bred, but not for a month or six weeks after it had arrived in many of the neighbouring parishes was its note to be heard within the limits of that particular parish. I could easily cite other cases of like nature, but many if not most observers of birds from their own experience will bear me out in this. It follows, therefore, that to render the proposed observations trustworthy, an

observer of any fact connected with birds should set down the exact locality at which it occurred, even if it be but a few miles' distance from his own station, and if possible again record the fact when it recurs there; or *vice versa*. Otherwise there will naturally be a risk of considerable error, but an attentive observer will probably soon come to find out the localities in his neighbourhood which are first visited by any particular kind of bird, and after a few years' experience the double observation will very likely prove unnecessary."

After giving some notes on a number of individual birds, Prof. Newton goes on:—

"Nearly all the observations above suggested can be made or collected by most residents in the country generally, and even by some who live in towns; but such observers as dwell at or near the seaside—and especially not far from the stations chosen by various sea-fowls for their breeding quarters—are recommended to keep watch for their arrival and departure. It has been frequently asserted that many of these birds, as the Guillemot, Puffin, Razorbill, and certain Gulls, resort to and quit their stations punctually on a particular day, regardless of the state of the weather; and if such statements are correct, the facts which render the birds independent of meteorological conditions seem to deserve attention. In some cases the assistance of lighthouse-keepers, if sought, would probably conduce to the success of the inquiry, as they almost always take an interest in the doings of their feathered neighbours. Lighthouse-keepers, it is believed, could also furnish valuable information as to the extraordinary flocks of migrant birds which occur by night at uncertain intervals. These flocks consist of a very heterogeneous assemblage, and it is seldom that the particular kinds can be identified except by the victims that may be found next morning lying dead beneath the glasses against which they have dashed themselves. Similar flocks are occasionally observed inland, and chiefly over or near large towns, whither it may be supposed they have been attracted by the glare of the street lamps. In these latter cases it is seldom that examples are procured to show of what species the flock was composed, but the mere fact of its occurrence is always worthy of record, with the precise hour at which the birds were heard, in a weather report. The cries, whistling, and screams of the birds, sometimes even the sound of their wings, are often enough to attract the attention of the most unobservant; and, as far as I know, these miscellaneous flocks only occur on perfectly still pitch-dark nights, with a comparatively high temperature and a falling barometer—circumstances that point to an atmospheric cause of the wonderful concurrence.

"A connection between the habits of birds and meteorological conditions is popularly believed to exist in the case of the Green Woodpecker, the frequent cry of which is said to presage rain; but I have failed to find that this is so. The Redbreast, on the other hand, when singing from an elevated perch at evening, is said to be an unfailing prophet of a fine day on the morrow, while if its parting song be uttered from a lower station bad weather is supposed to follow. As far as my own experience goes, the only connection between changes of weather and the habits of birds (omitting of course hard frost and deep snow, the effects of which are obvious) is, that many birds seem to be more alert, or 'wilder,' as the sportsmen say, for a day or two before a heavy downfall; I have observed this with partridges, plovers, and snipes."

We recommend all our readers to procure these "Instructions."

INSTITUTION OF NAVAL ARCHITECTS

AT the annual meeting of this Institution last week, three papers of interest to the scientific world were read and discussed. All three of these papers bore upon

* *Ibid.*, 1872, p. 361.

† Instructions for the Observation of Phenological Phenomena, prepared at the request of the Council of the Meteorological Society by a Conference consisting of Delegates from the following Societies, viz.: Royal Agricultural Society, Royal Botanic Society, Royal Dublin Society, Royal Horticultural Society, Marlborough College Natural History Society, Meteorological Society.